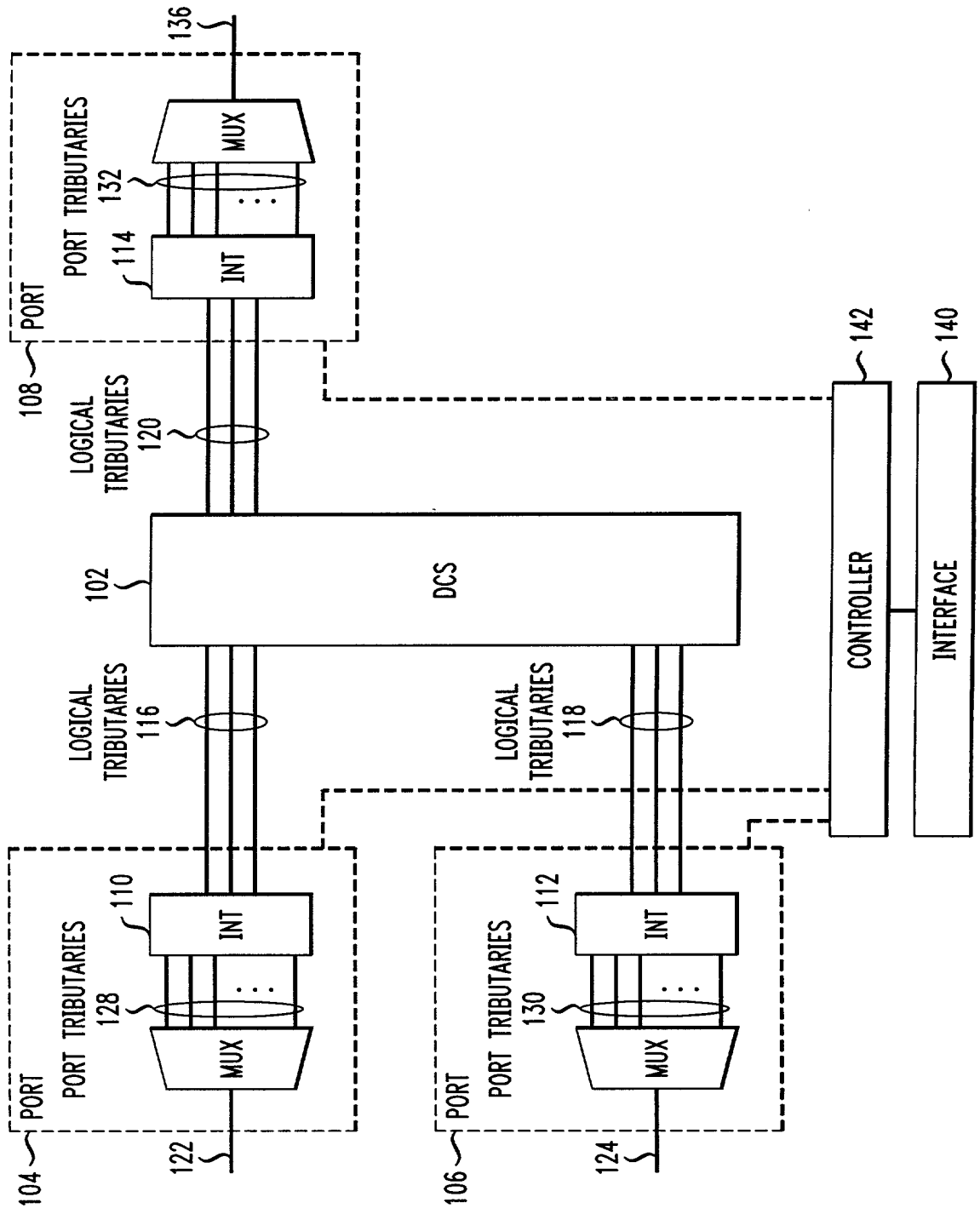

136
MUX
PORT TRIBUTARIES
132
114
INT
PORT
108
LOGICAL TRIBUTARIES
120
142
140
102
DCS
CONTROLLER
INTERFACE
LOGICAL TRIBUTARIES
116
LOGICAL TRIBUTARIES
118
110
INT
PORT TRIBUTARIES
128
MUX
PORT
104
122
112
INT
PORT TRIBUTARIES
130
MUX
PORT
106
124

FIG. 1

FIG. 2

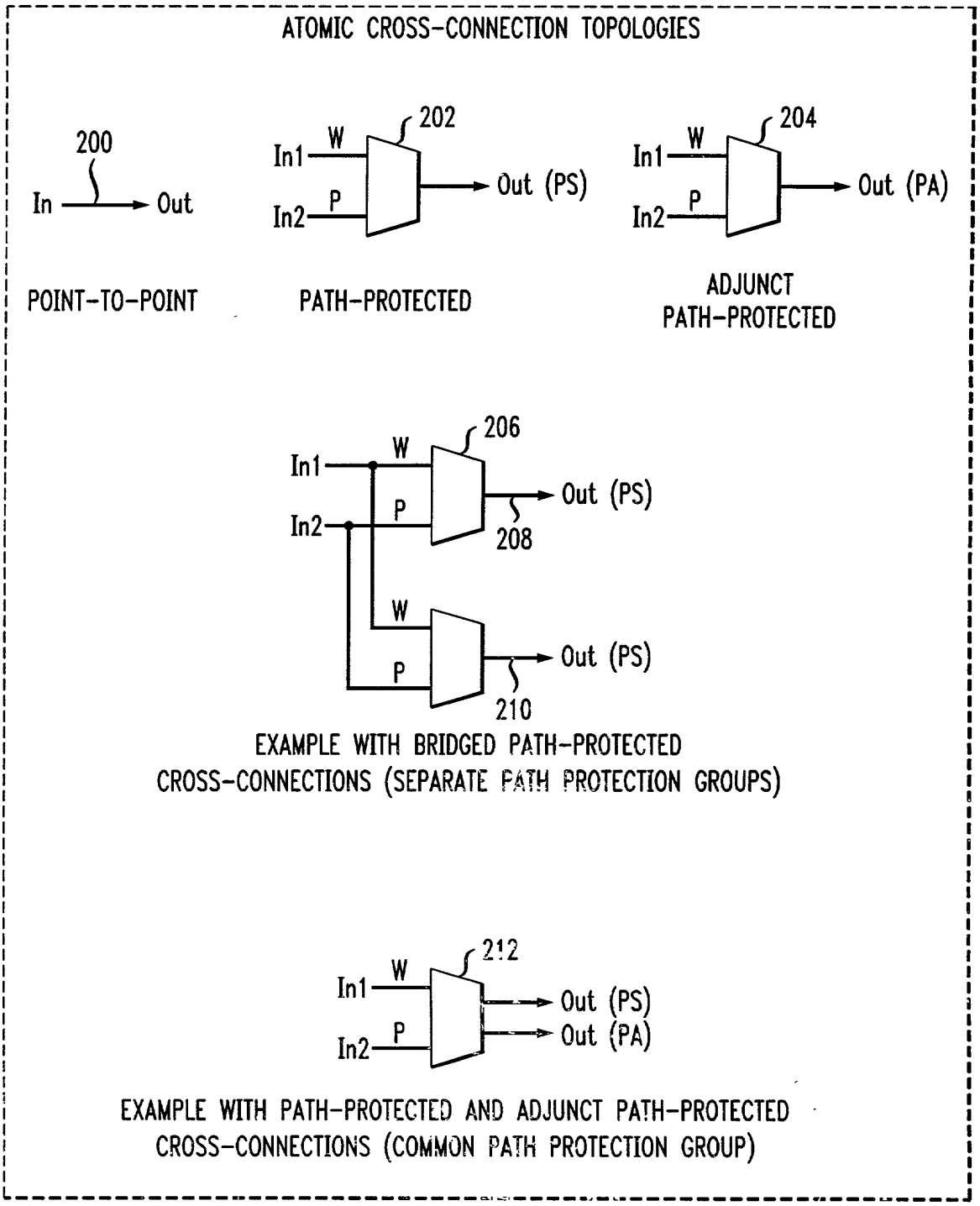
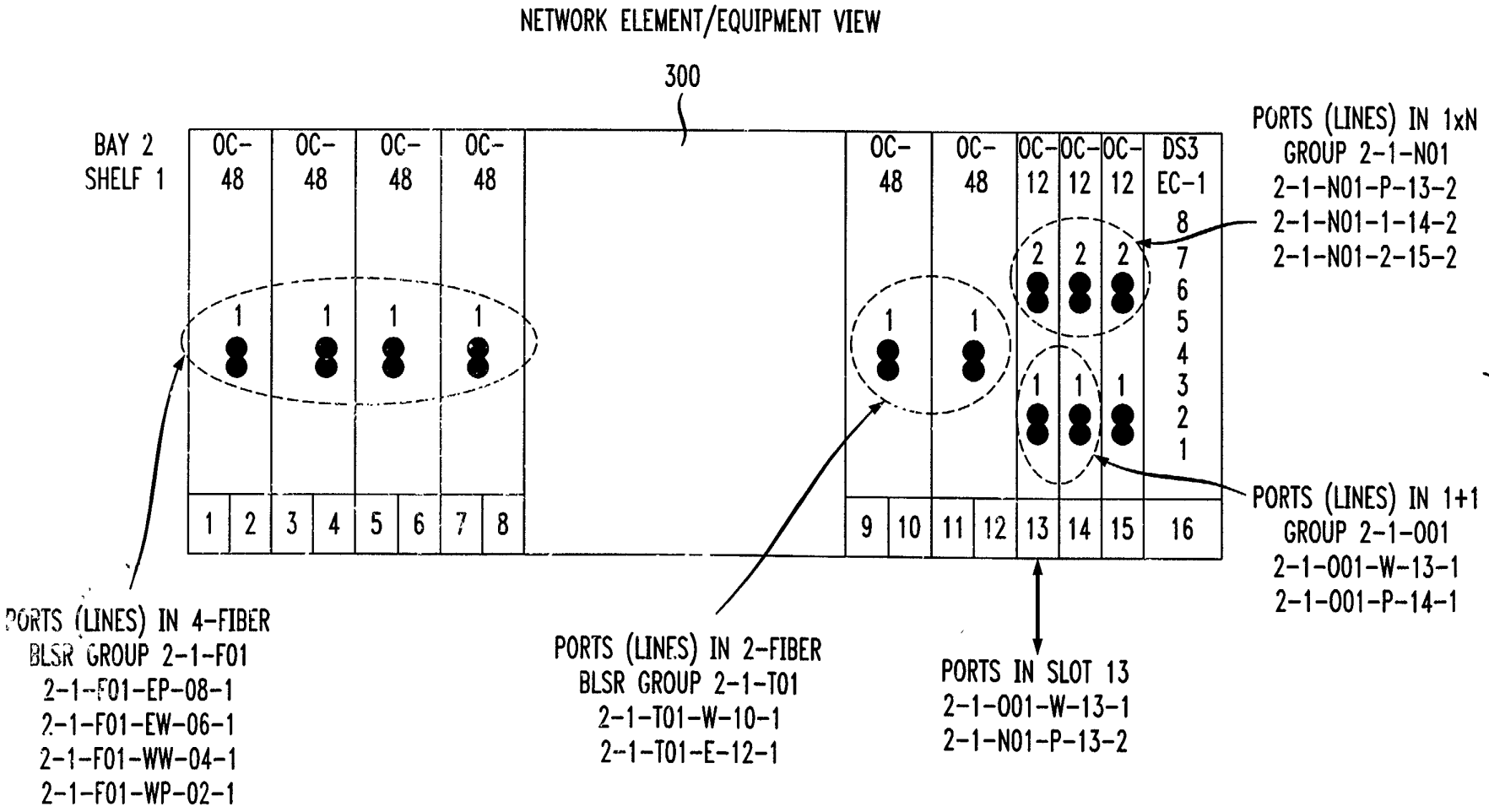

ATOMIC CROSS-CONNECTION TOPOLOGIES
200
In
Out
POINT-TO-POINT
202
In1
W
In2
P
Out (PS)
PATH-PROTECTED
204
In1
W
In2
P
Out (PA)
ADJUNCT
PATH-PROTECTED
206
In1
W
In2
P
Out (PS)
208
W
P
Out (PS)
210
EXAMPLE WITH BRIDGED PATH-PROTECTED
CROSS-CONNECTIONS (SEPARATE PATH PROTECTION GROUPS)
212
In1
W
In2
P
Out (PS)
Out (PA)
EXAMPLE WITH PATH-PROTECTED AND ADJUNCT PATH-PROTECTED
CROSS-CONNECTIONS (COMMON PATH PROTECTION GROUP)

FIG. 3A



Integrated Network Element
Falkenstein 1-1-8
Serial No.: 09/910,601
Moser, Patterson & Sheridan, LLP (732) 530-9404

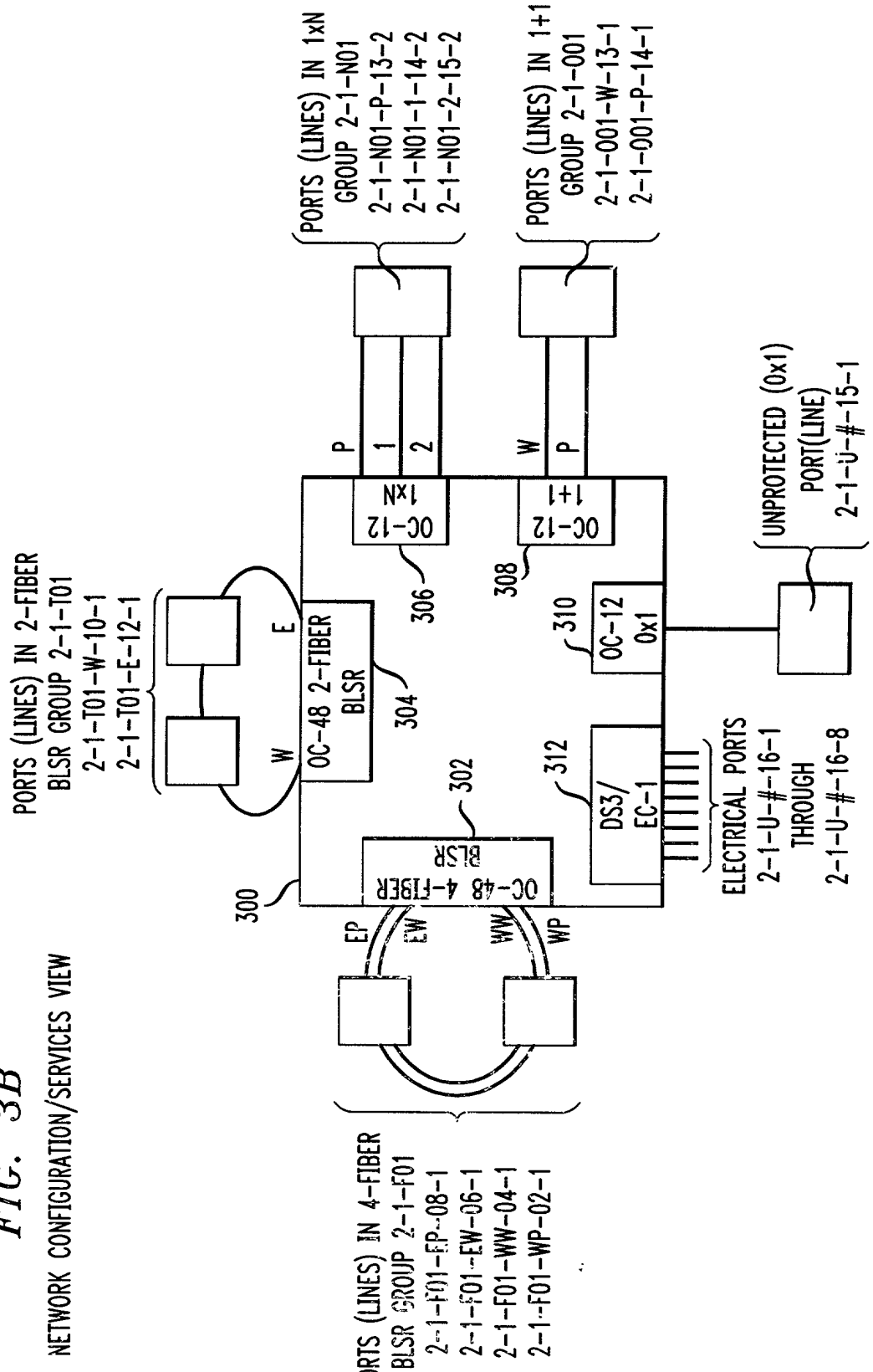


FIG. 3B

NETWORK CONFIGURATION/SERVICES VIEW

FIG. 4

OPERATIONS ON ENTITIES:
FM/PM-L: LINE-LEVEL FM/PM (PORT/LINE INPUTS, DS3 OUTPUTS)
FM/PM-P: PATH-LEVEL FM/PM (LOGICAL INPUT TRIBUTARIES)
XC: CROSS-CONNECTIONS (LOGICAL INPUT/OUTPUT TRIBUTARIES)
R-P: PATH-LEVEL RETRIEVAL ON PORT TRIBUTARY (INPUT PORT TRIBUTARIES)
APS-L: LINE PROTECTION (PORT PROTECTION GROUPS, RING-SIDES W/E, LINES W/P)
APS-P: PATH PROTECTION (PATH PROTECTION GROUPS, CONSTITUENT PATH SELECTORS = LOGICAL OUTPUT TRIBUTARIES)

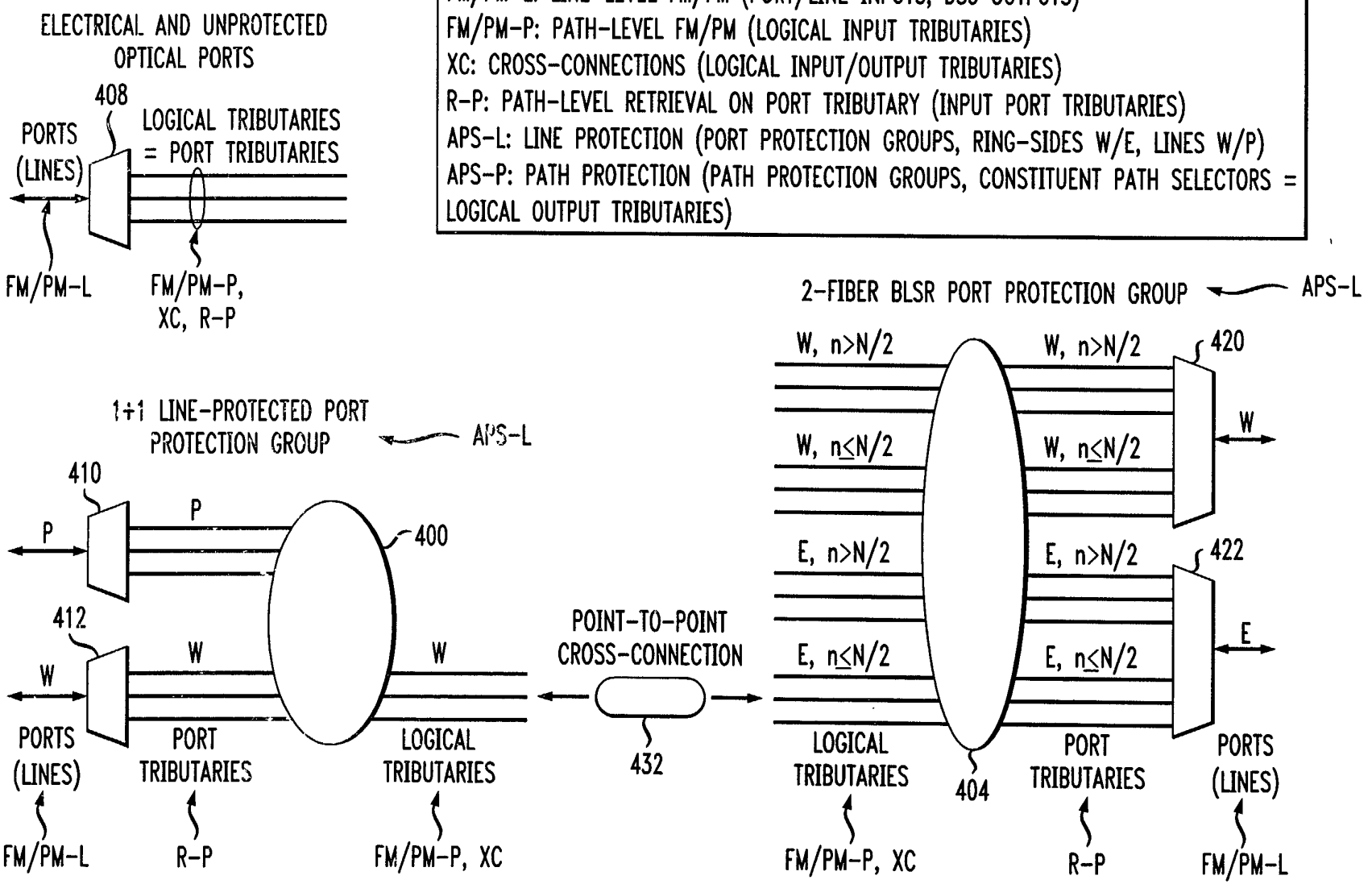


FIG. 4 cont.

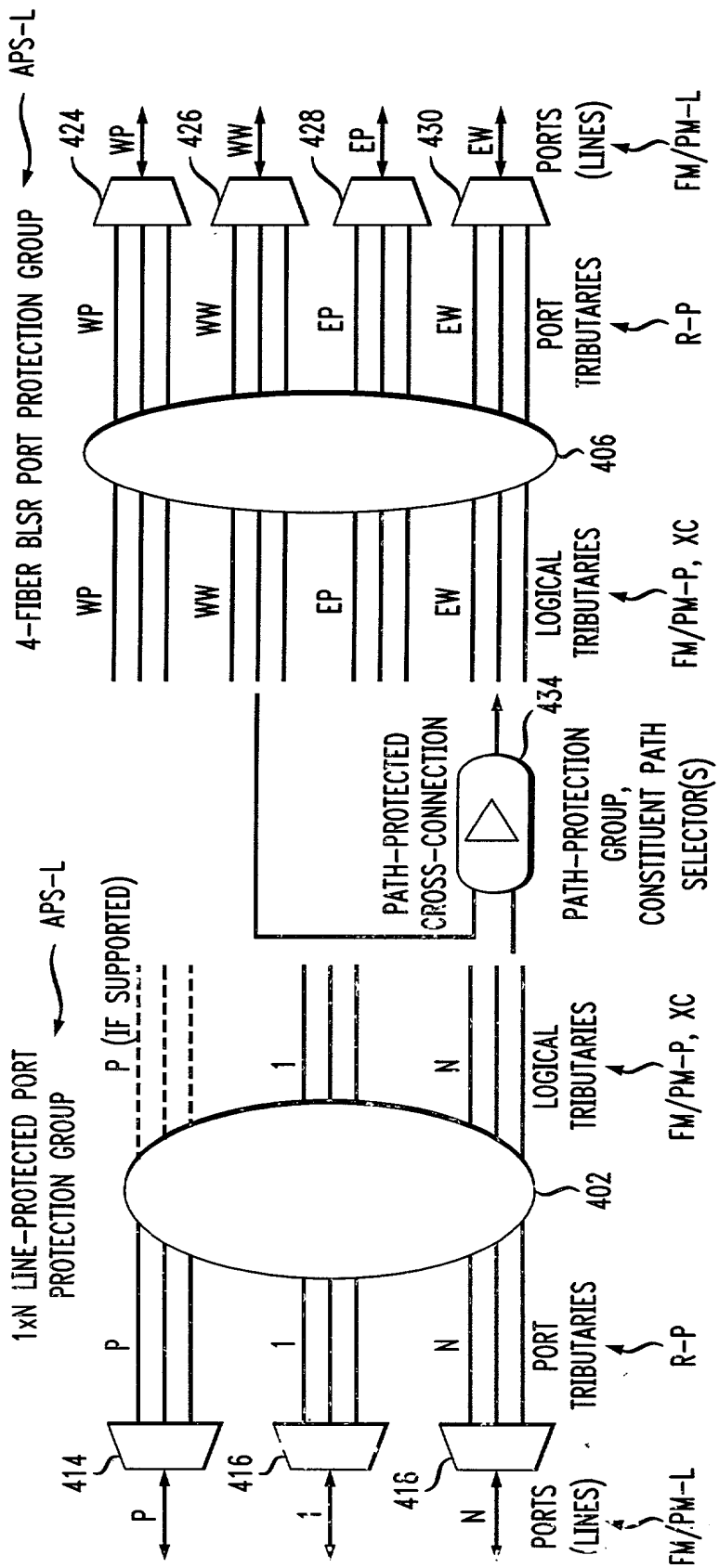

4-FIBER BLSR PORT PROTECTION GROUP
APS-L
424
426
428
430
WP
WW
EP
EW
PORTS (LINES)
FM/PM-L
PORT TRIBUTARIES
R-P
406
LOGICAL TRIBUTARIES
FM/PM-P, XC
PATH-PROTECTED CROSS-CONNECTION
434
PATH-PROTECTION GROUP, CONSTITUENT PATH SELECTOR(S)
APS-P
1xN LINE-PROTECTED PORT PROTECTION GROUP
APS-L
P (IF SUPPORTED)
1
N
402
414
416
P
1
N
PORTS (LINES)
FM/PM-L
PORT TRIBUTARIES
R-P
LOGICAL TRIBUTARIES
FM/PM-P, XC

FIG. 5

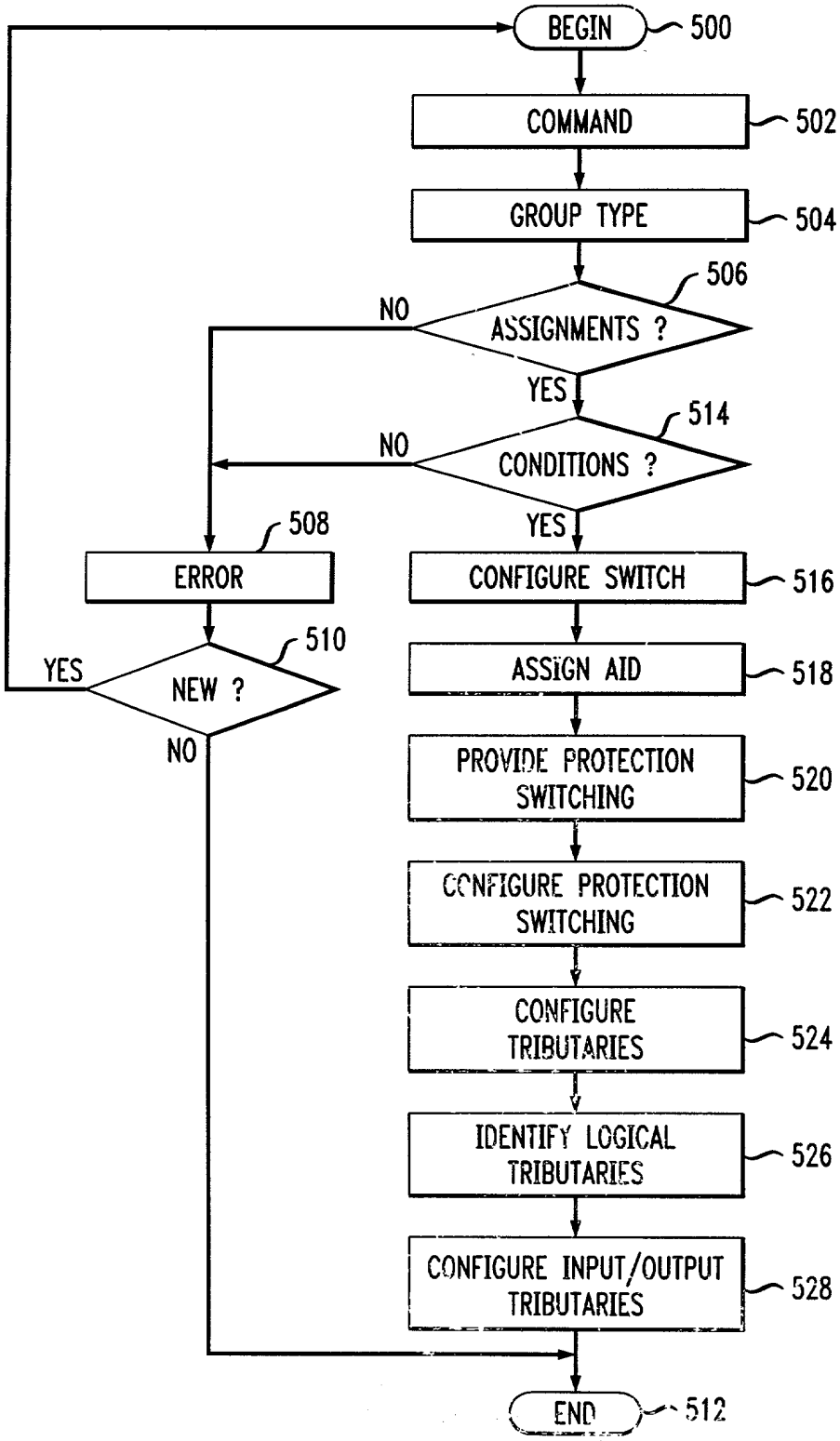

BEGIN
500
COMMAND
502
GROUP TYPE
504
506
ASSIGNMENTS ?
NO
YES
514
CONDITIONS ?
NO
YES
508
ERROR
510
NEW ?
YES
NO
CONFIGURE SWITCH
516
ASSIGN AID
518
PROVIDE PROTECTION SWITCHING
520
CONFIGURE PROTECTION SWITCHING
522
CONFIGURE TRIBUTARIES
524
IDENTIFY LOGICAL TRIBUTARIES
526
CONFIGURE INPUT/OUTPUT TRIBUTARIES
528
END
512

FIG. 6

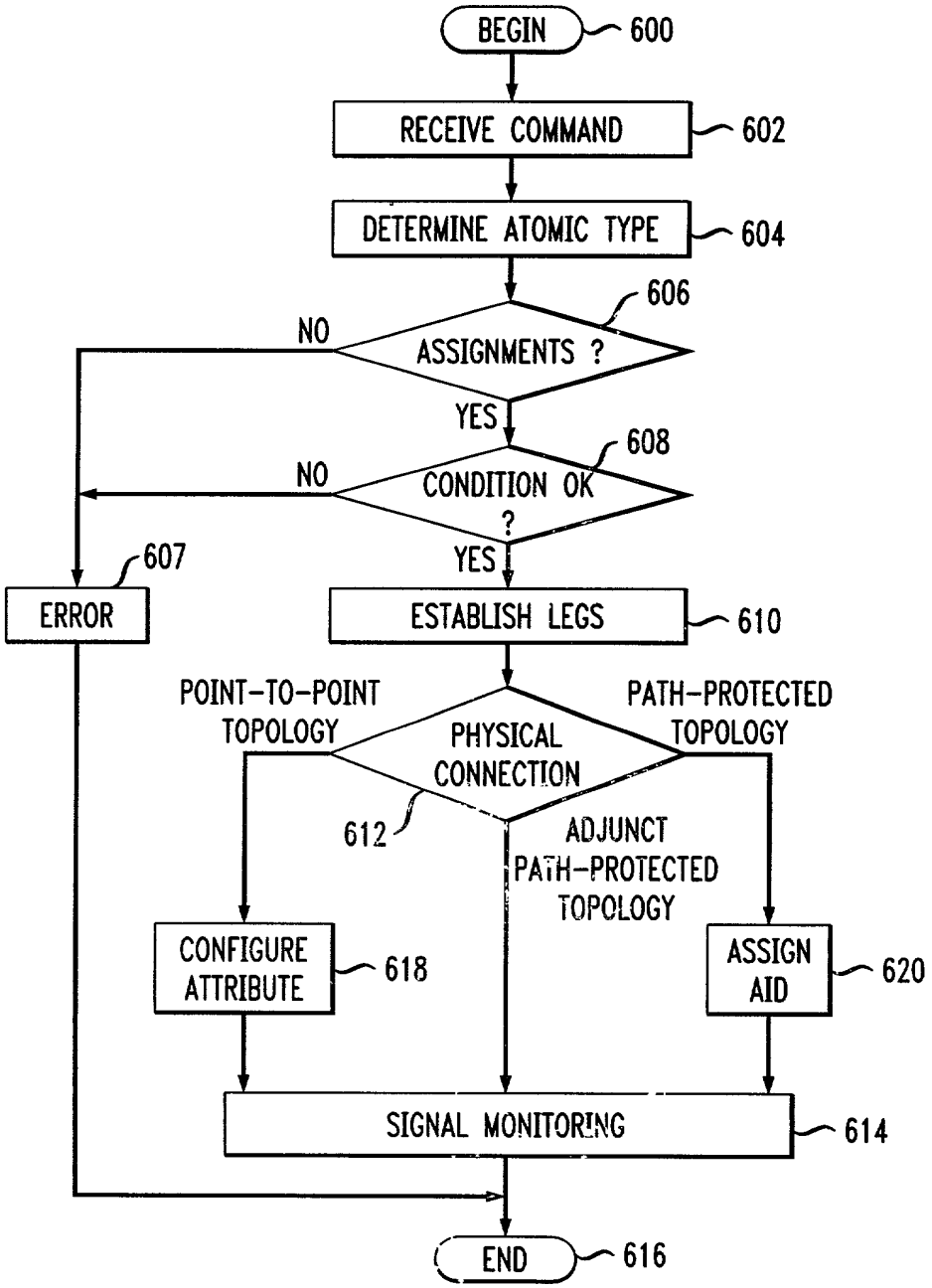

BEGIN
600
RECEIVE COMMAND
602
DETERMINE ATOMIC TYPE
604
606
NO
ASSIGNMENTS ?
YES
608
NO
CONDITION OK ?
YES
607
ERROR
ESTABLISH LEGS
610
POINT-TO-POINT TOPOLOGY
PHYSICAL CONNECTION
PATH-PROTECTED TOPOLOGY
612
ADJUNCT PATH-PROTECTED TOPOLOGY
CONFIGURE ATTRIBUTE
618
ASSIGN AID
620
SIGNAL MONITORING
614
END
616

FIG. 7

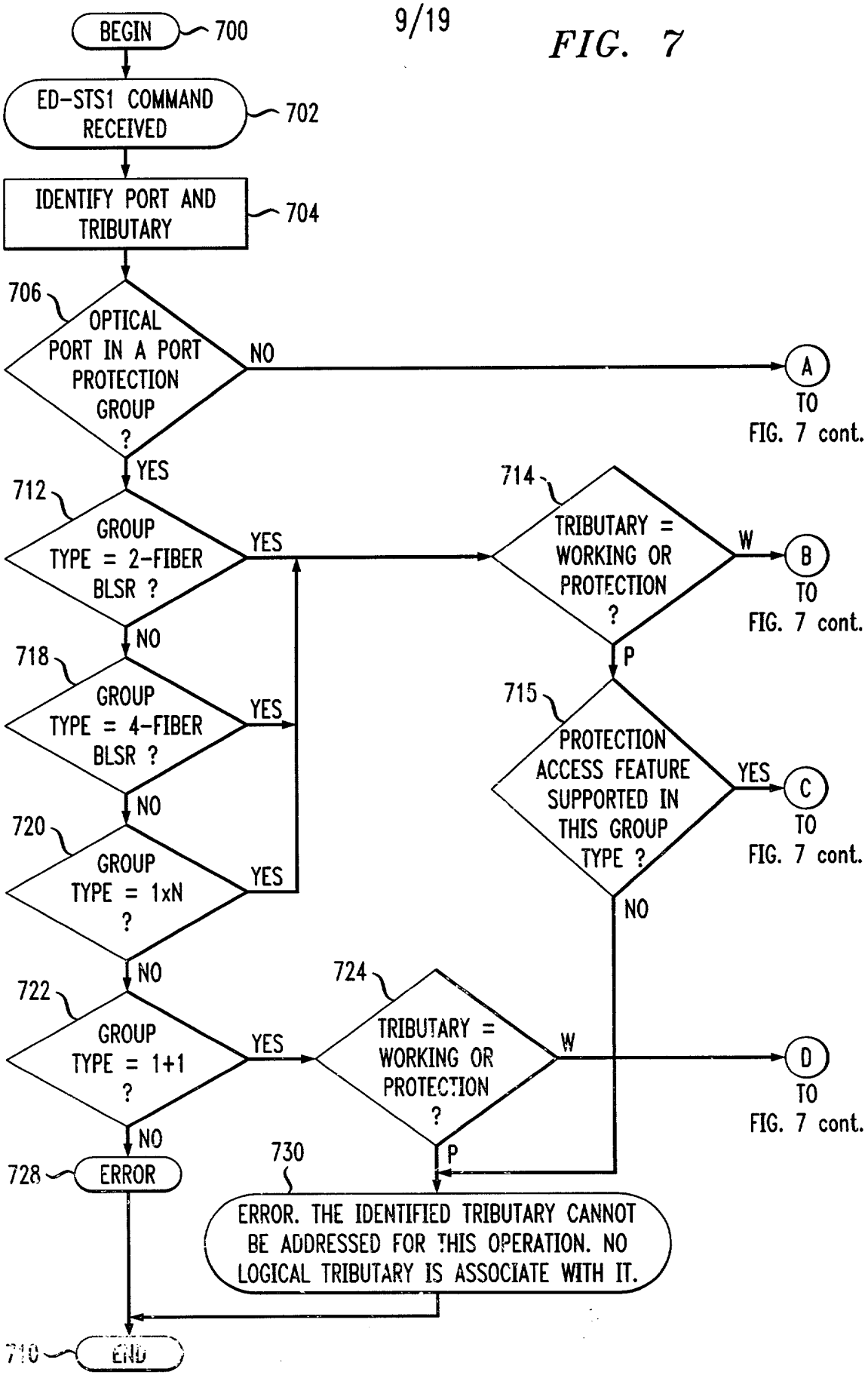

BEGIN
700
ED-STS1 COMMAND RECEIVED
702
IDENTIFY PORT AND TRIBUTARY
704
706
OPTICAL PORT IN A PORT PROTECTION GROUP ?
NO
A
TO FIG. 7 cont.
YES
712
GROUP TYPE = 2-FIBER BLSR ?
YES
714
TRIBUTARY = WORKING OR PROTECTION ?
W
B
TO FIG. 7 cont.
NO
718
GROUP TYPE = 4-FIBER BLSR ?
YES
P
715
PROTECTION ACCESS FEATURE SUPPORTED IN THIS GROUP TYPE ?
YES
C
TO FIG. 7 cont.
NO
720
GROUP TYPE = 1xN ?
YES
NO
724
722
GROUP TYPE = 1+1 ?
YES
TRIBUTARY = WORKING OR PROTECTION ?
W
D
TO FIG. 7 cont.
NO
728
ERROR
730
P
ERROR. THE IDENTIFIED TRIBUTARY CANNOT BE ADDRESSED FOR THIS OPERATION. NO LOGICAL TRIBUTARY IS ASSOCIATE WITH IT.
710
END

FIG. 7 cont.

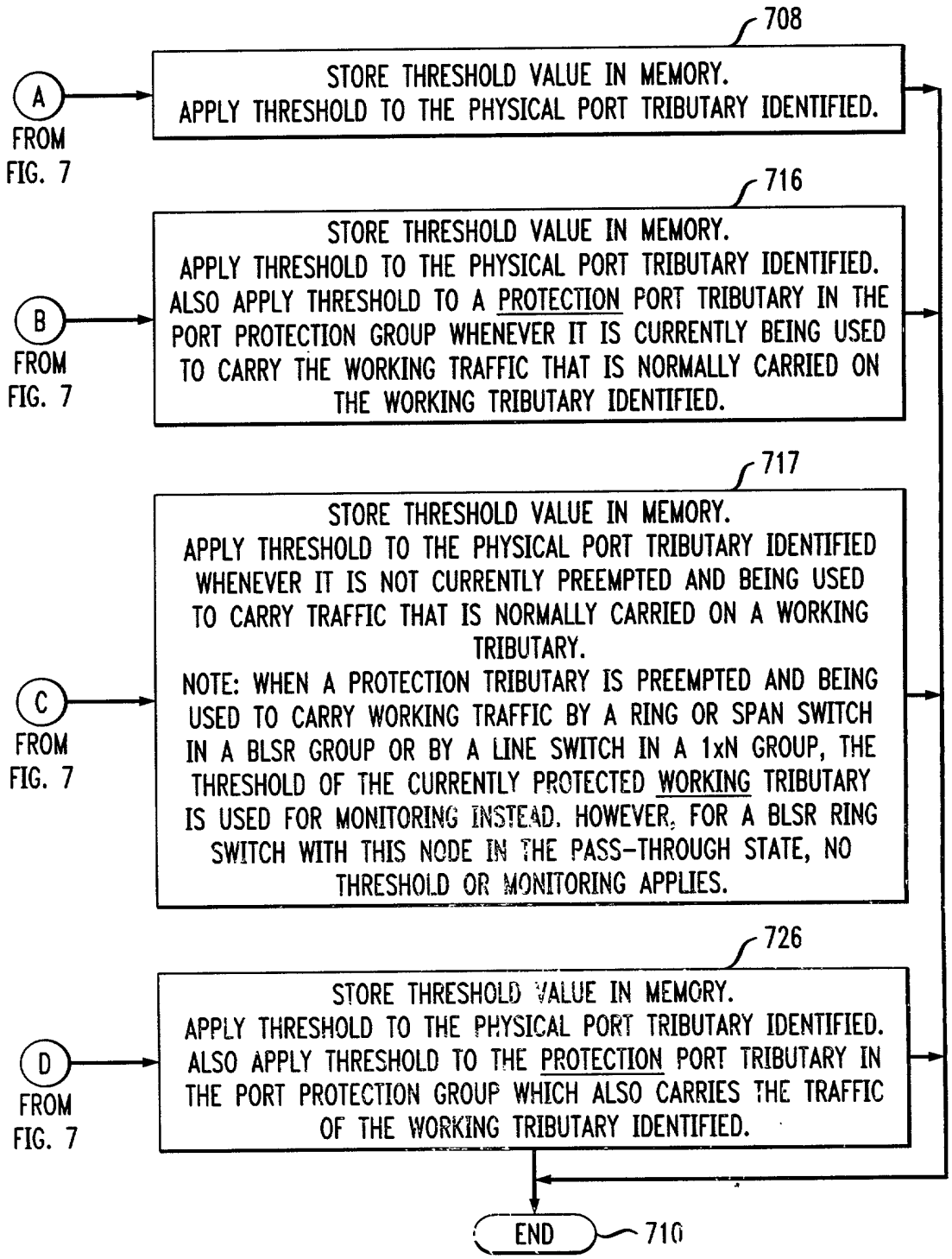

708
STORE THRESHOLD VALUE IN MEMORY.
APPLY THRESHOLD TO THE PHYSICAL PORT TRIBUTARY IDENTIFIED.
A
FROM FIG. 7
716
STORE THRESHOLD VALUE IN MEMORY.
APPLY THRESHOLD TO THE PHYSICAL PORT TRIBUTARY IDENTIFIED.
ALSO APPLY THRESHOLD TO A PROTECTION PORT TRIBUTARY IN THE PORT PROTECTION GROUP WHENEVER IT IS CURRENTLY BEING USED TO CARRY THE WORKING TRAFFIC THAT IS NORMALLY CARRIED ON THE WORKING TRIBUTARY IDENTIFIED.
B
FROM FIG. 7
717
STORE THRESHOLD VALUE IN MEMORY.
APPLY THRESHOLD TO THE PHYSICAL PORT TRIBUTARY IDENTIFIED WHENEVER IT IS NOT CURRENTLY PREEMPTED AND BEING USED TO CARRY TRAFFIC THAT IS NORMALLY CARRIED ON A WORKING TRIBUTARY.
NOTE: WHEN A PROTECTION TRIBUTARY IS PREEMPTED AND BEING USED TO CARRY WORKING TRAFFIC BY A RING OR SPAN SWITCH IN A BLSR GROUP OR BY A LINE SWITCH IN A 1xN GROUP, THE THRESHOLD OF THE CURRENTLY PROTECTED WORKING TRIBUTARY IS USED FOR MONITORING INSTEAD. HOWEVER, FOR A BLSR RING SWITCH WITH THIS NODE IN THE PASS-THROUGH STATE, NO THRESHOLD OR MONITORING APPLIES.
C
FROM FIG. 7
726
STORE THRESHOLD VALUE IN MEMORY.
APPLY THRESHOLD TO THE PHYSICAL PORT TRIBUTARY IDENTIFIED.
ALSO APPLY THRESHOLD TO THE PROTECTION PORT TRIBUTARY IN THE PORT PROTECTION GROUP WHICH ALSO CARRIES THE TRAFFIC OF THE WORKING TRIBUTARY IDENTIFIED.
D
FROM FIG. 7
END
710

FIG. 8

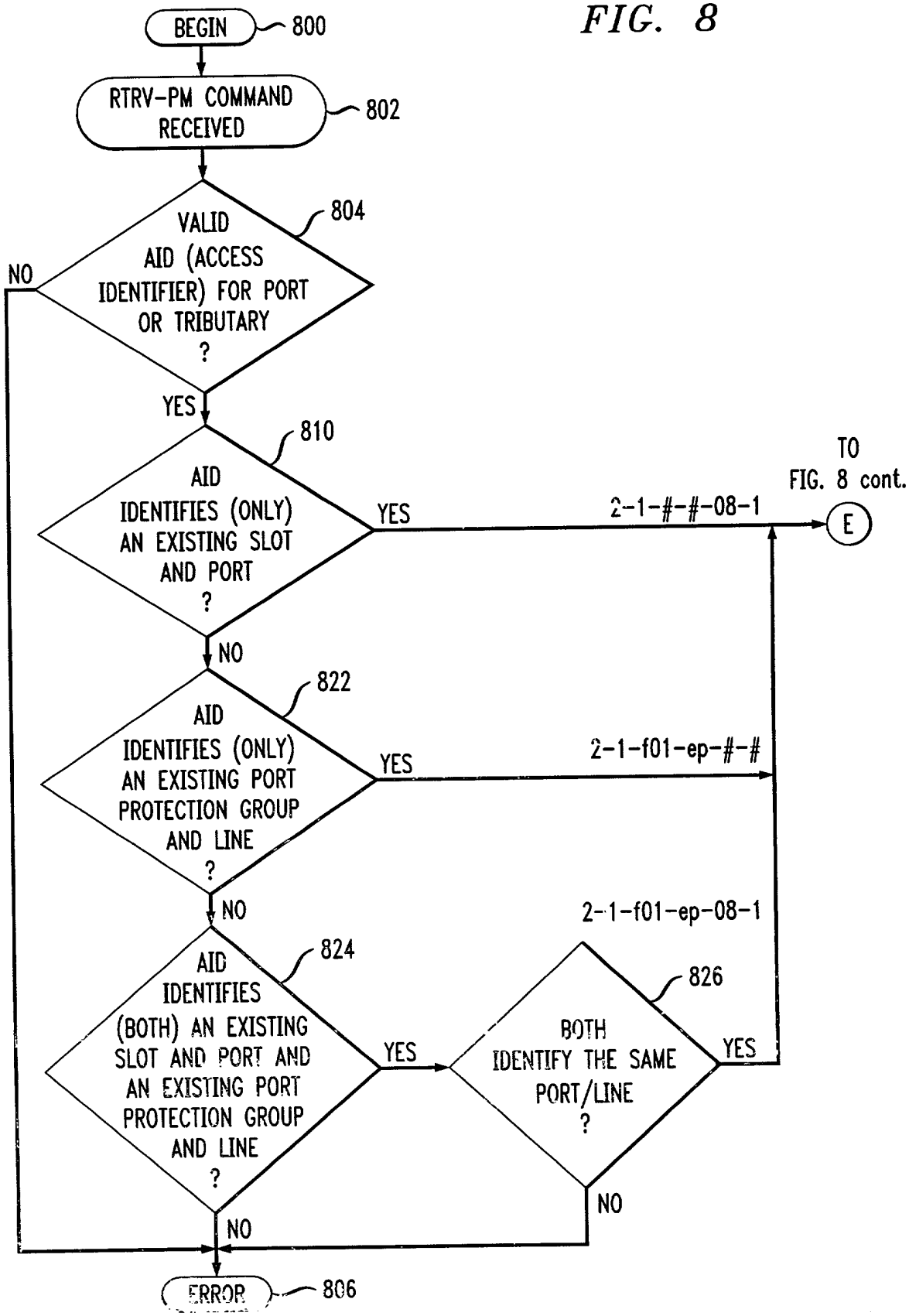

BEGIN
800
RTRV-PM COMMAND RECEIVED
802
VALID AID (ACCESS IDENTIFIER) FOR PORT OR TRIBUTARY ?
804
NO
YES
AID IDENTIFIES (ONLY) AN EXISTING SLOT AND PORT ?
810
YES
2-1-#-#-08-1
TO FIG. 8 cont.
E
NO
AID IDENTIFIES (ONLY) AN EXISTING PORT PROTECTION GROUP AND LINE ?
822
YES
2-1-f01-ep-#-#
NO
2-1-f01-ep-08-1
AID IDENTIFIES (BOTH) AN EXISTING SLOT AND PORT AND AN EXISTING PORT PROTECTION GROUP AND LINE ?
824
YES
BOTH IDENTIFY THE SAME PORT/LINE ?
826
YES
NO
NO
ERROR
806

FIG. 8 cont.

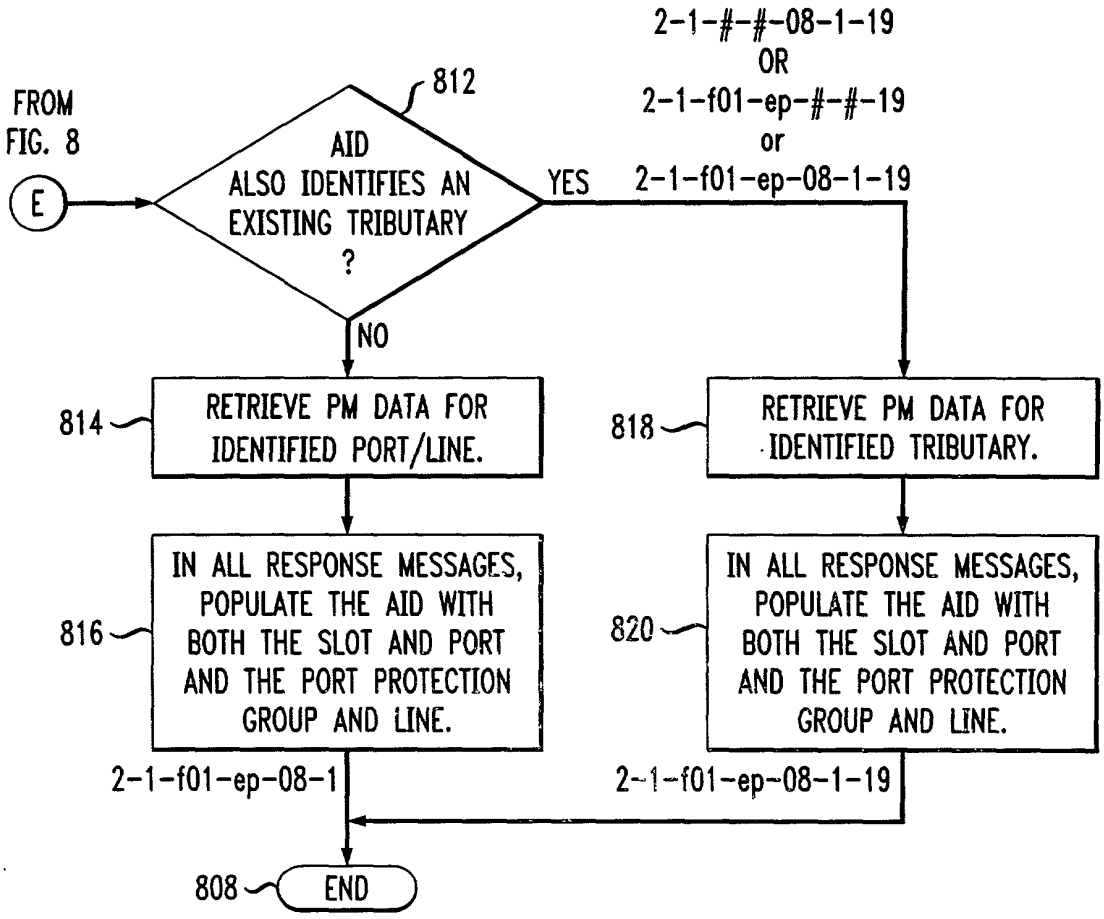

FROM FIG. 8
E
812
AID ALSO IDENTIFIES AN EXISTING TRIBUTARY ?
YES
2-1-#-#-08-1-19
OR
2-1-f01-ep-#-#-19
or
2-1-f01-ep-08-1-19
NO
814
RETRIEVE PM DATA FOR IDENTIFIED PORT/LINE.
818
RETRIEVE PM DATA FOR IDENTIFIED TRIBUTARY.
816
IN ALL RESPONSE MESSAGES, POPULATE THE AID WITH BOTH THE SLOT AND PORT AND THE PORT PROTECTION GROUP AND LINE.
820
IN ALL RESPONSE MESSAGES, POPULATE THE AID WITH BOTH THE SLOT AND PORT AND THE PORT PROTECTION GROUP AND LINE.
2-1-f01-ep-08-1
2-1-f01-ep-08-1-19
808
END

FIG. 9

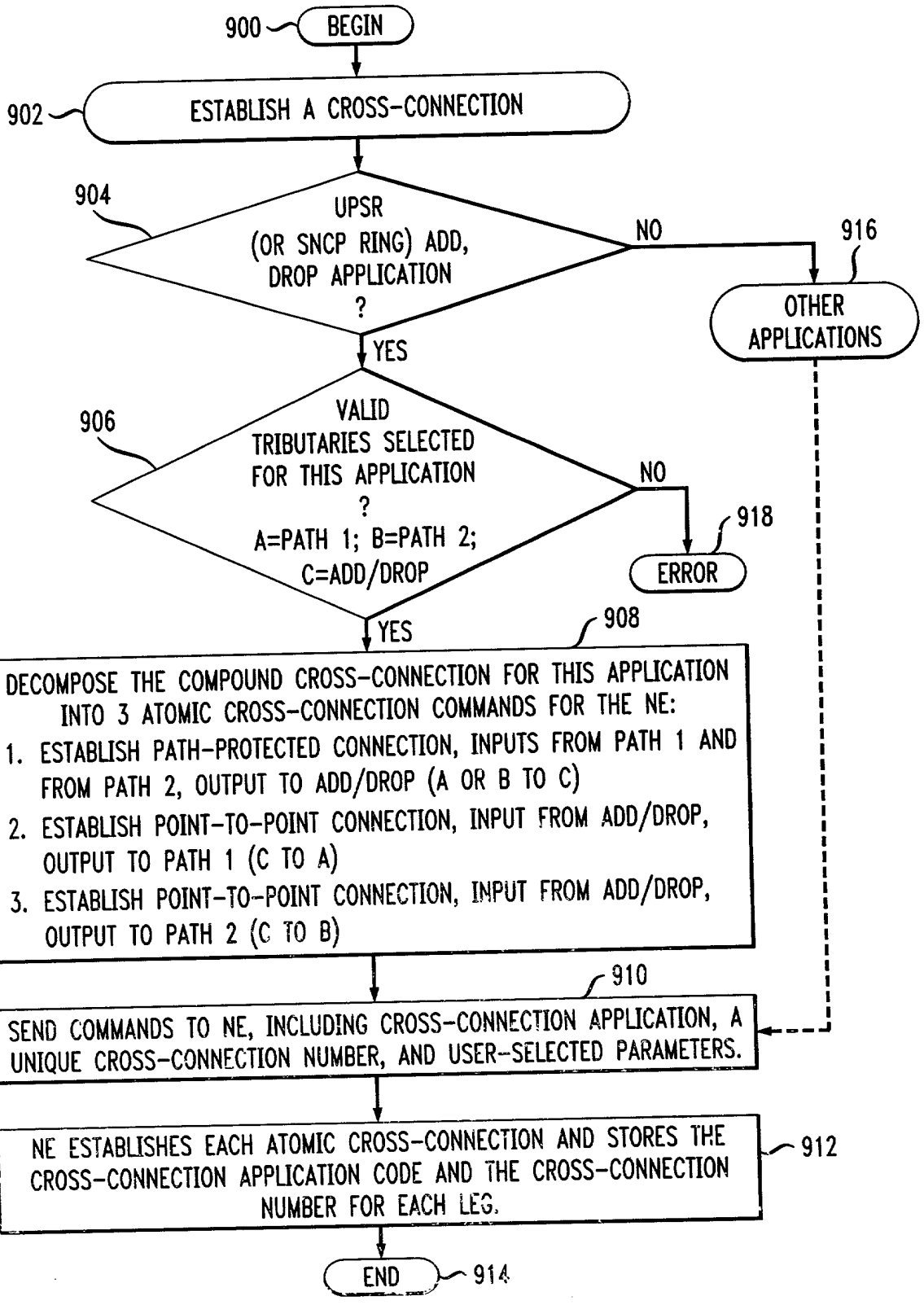

900
BEGIN
902
ESTABLISH A CROSS-CONNECTION
904
UPSR (OR SNCP RING) ADD, DROP APPLICATION ?
NO
916
OTHER APPLICATIONS
YES
906
VALID TRIBUTARIES SELECTED FOR THIS APPLICATION ?
A=PATH 1; B=PATH 2; C=ADD/DROP
NO
918
ERROR
YES
908
DECOMPOSE THE COMPOUND CROSS-CONNECTION FOR THIS APPLICATION INTO 3 ATOMIC CROSS-CONNECTION COMMANDS FOR THE NE:
1. ESTABLISH PATH-PROTECTED CONNECTION, INPUTS FROM PATH 1 AND FROM PATH 2, OUTPUT TO ADD/DROP (A OR B TO C)
2. ESTABLISH POINT-TO-POINT CONNECTION, INPUT FROM ADD/DROP, OUTPUT TO PATH 1 (C TO A)
3. ESTABLISH POINT-TO-POINT CONNECTION, INPUT FROM ADD/DROP, OUTPUT TO PATH 2 (C TO B)
910
SEND COMMANDS TO NE, INCLUDING CROSS-CONNECTION APPLICATION, A UNIQUE CROSS-CONNECTION NUMBER, AND USER-SELECTED PARAMETERS.
NE ESTABLISHES EACH ATOMIC CROSS-CONNECTION AND STORES THE CROSS-CONNECTION APPLICATION CODE AND THE CROSS-CONNECTION NUMBER FOR EACH LEG.
912
END
914

FIG. 10

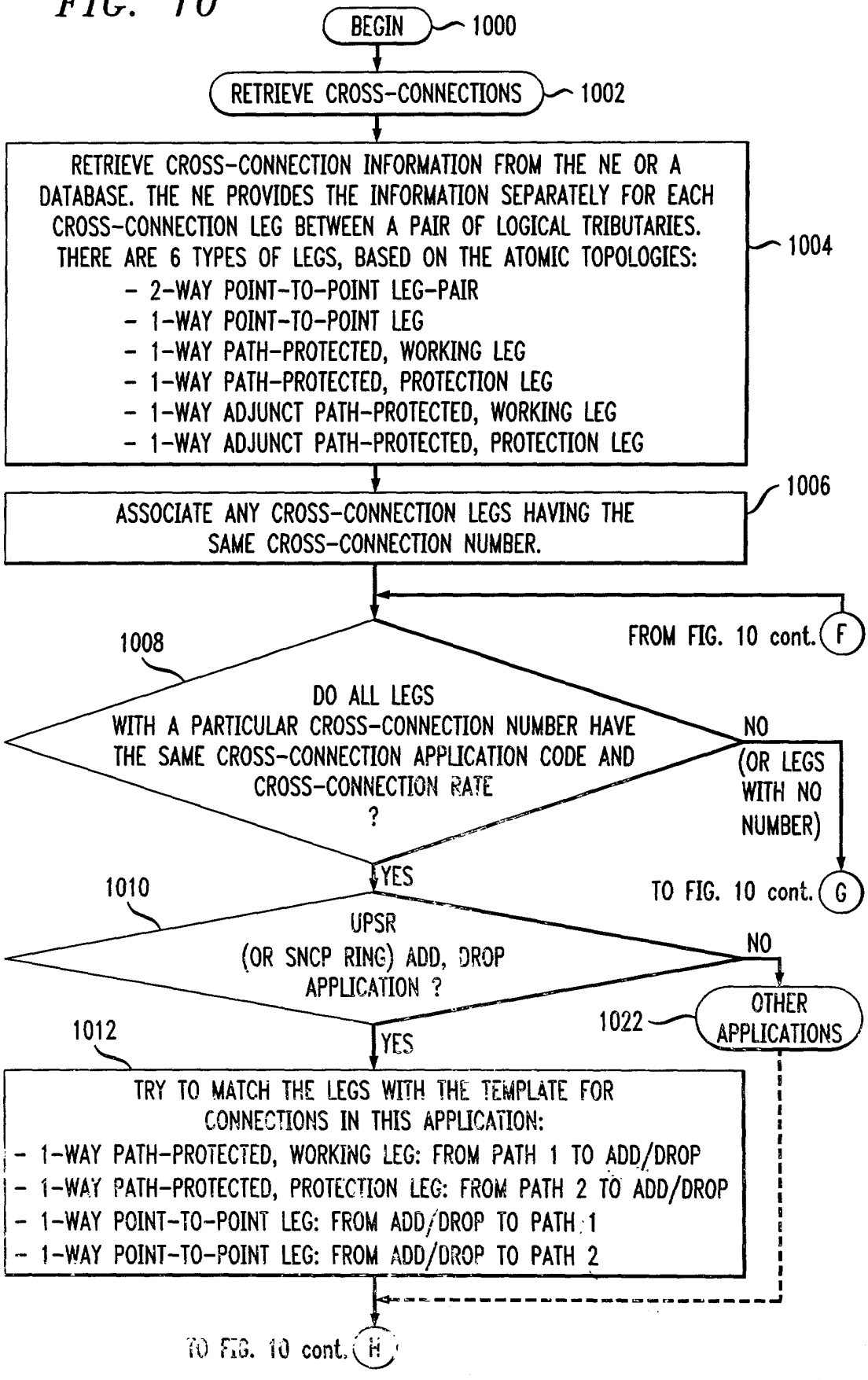


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FIG. 10 cont.

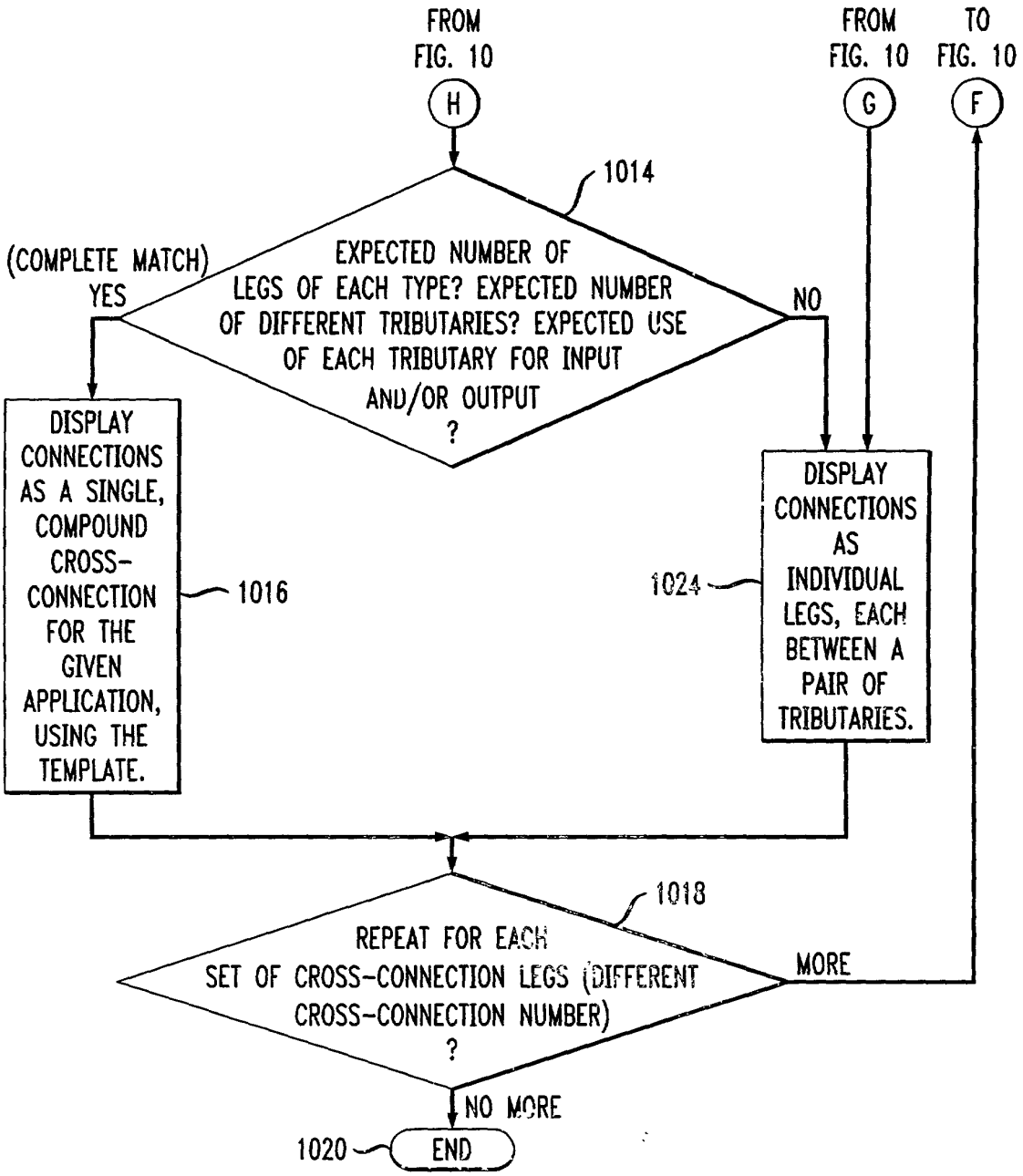
FROM FIG. 10
H
FROM FIG. 10
G
TO FIG. 10
F
1014
EXPECTED NUMBER OF LEGS OF EACH TYPE? EXPECTED NUMBER OF DIFFERENT TRIBUTARIES? EXPECTED USE OF EACH TRIBUTARY FOR INPUT AND/OR OUTPUT ?
(COMPLETE MATCH) YES
NO
DISPLAY CONNECTIONS AS A SINGLE, COMPOUND CROSS-CONNECTION FOR THE GIVEN APPLICATION, USING THE TEMPLATE.
1016
DISPLAY CONNECTIONS AS INDIVIDUAL LEGS, EACH BETWEEN A PAIR OF TRIBUTARIES.
1024
1018
REPEAT FOR EACH SET OF CROSS-CONNECTION LEGS (DIFFERENT CROSS-CONNECTION NUMBER) ?
MORE
NO MORE
1020
END

FIG. 11

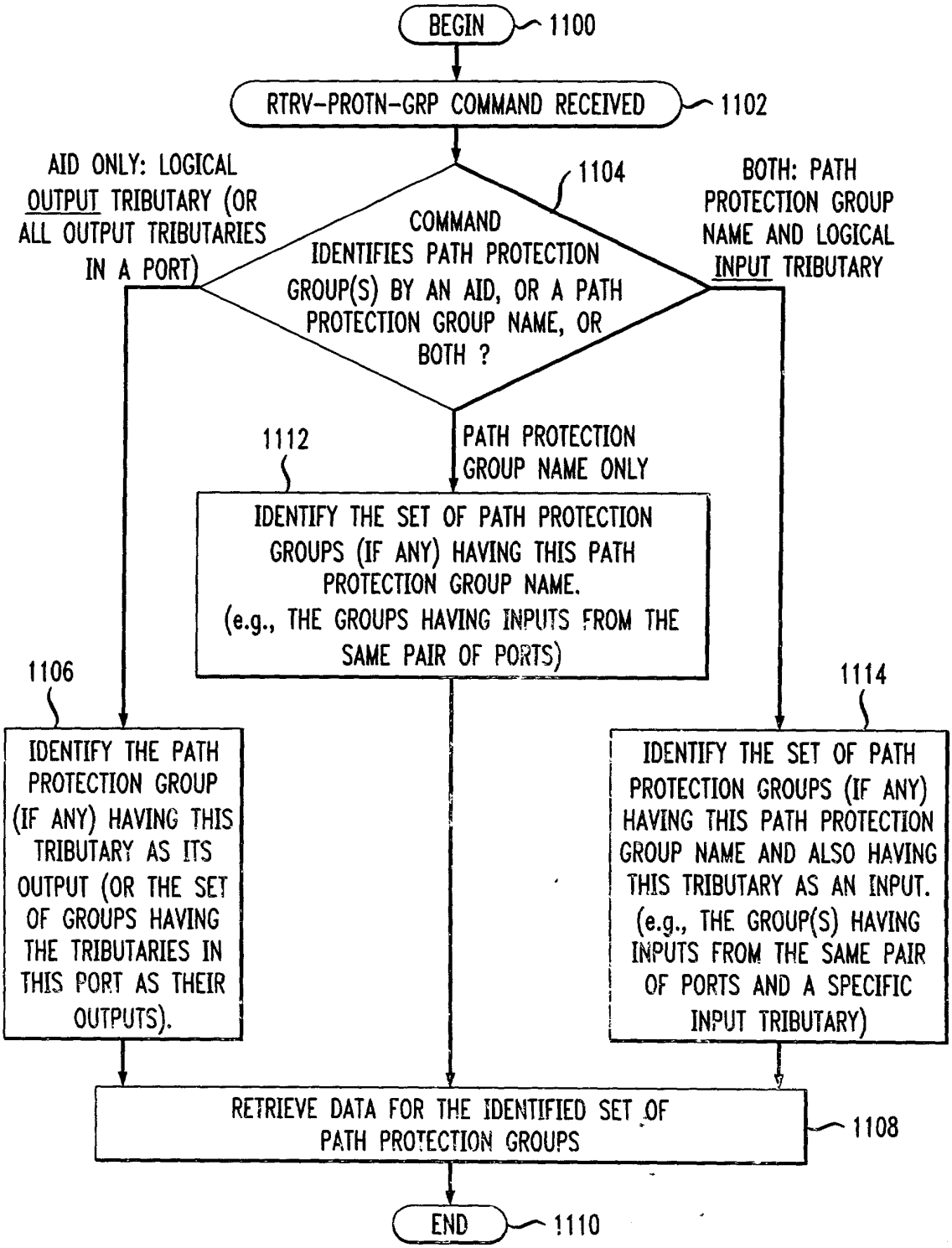

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FIG. 12

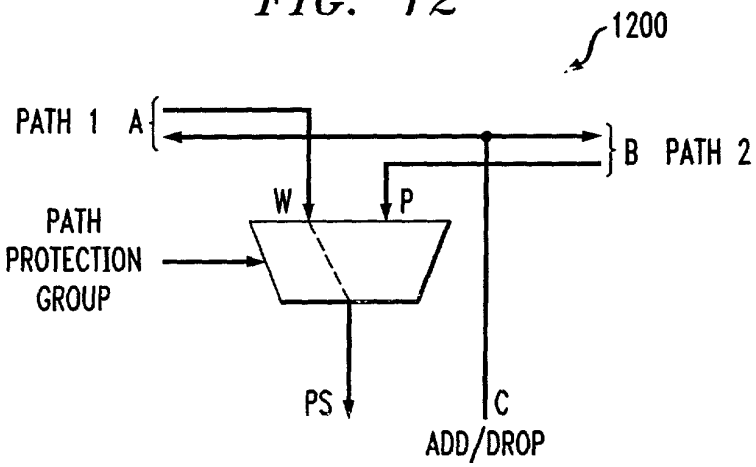

1200
PATH 1
A
B
PATH 2
W
P
PATH
PROTECTION
GROUP
PS
C
ADD/DROP

FIG. 13

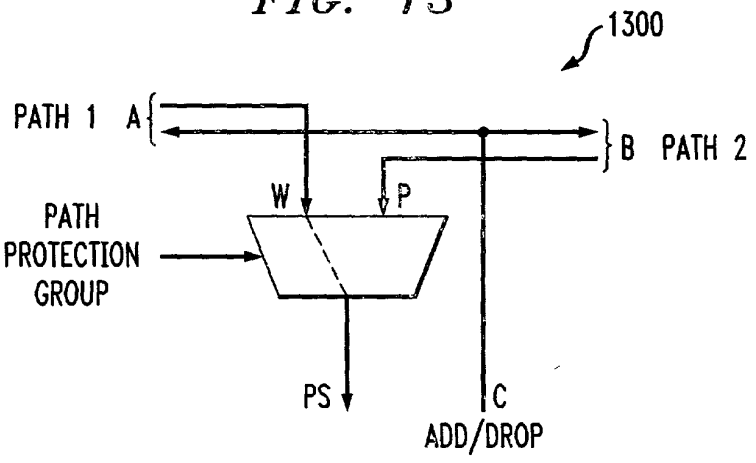

1300
PATH 1
A
B
PATH 2
W
P
PATH
PROTECTION
GROUP
PS
C
ADD/DROP

FIG. 14

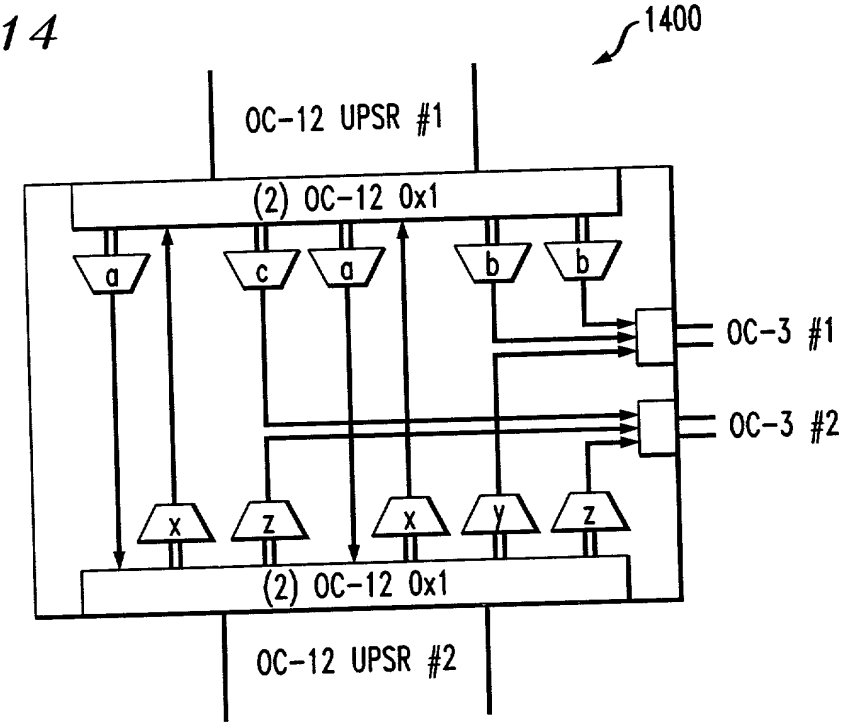
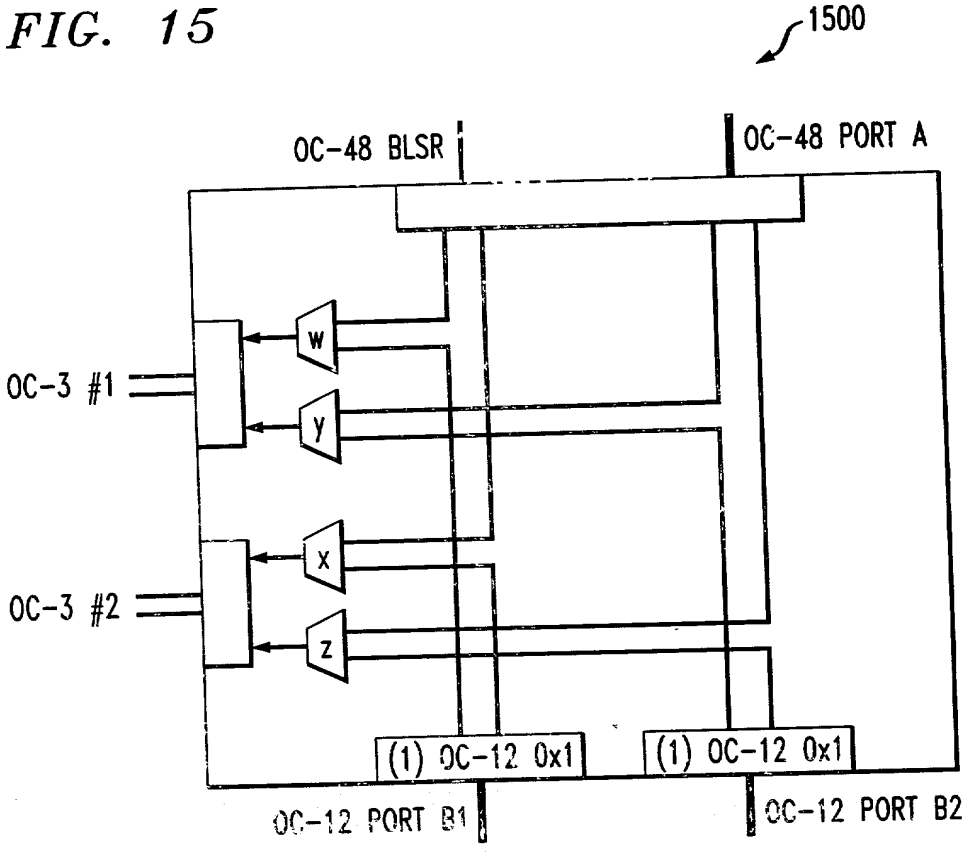


FIG. 15



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20020075660
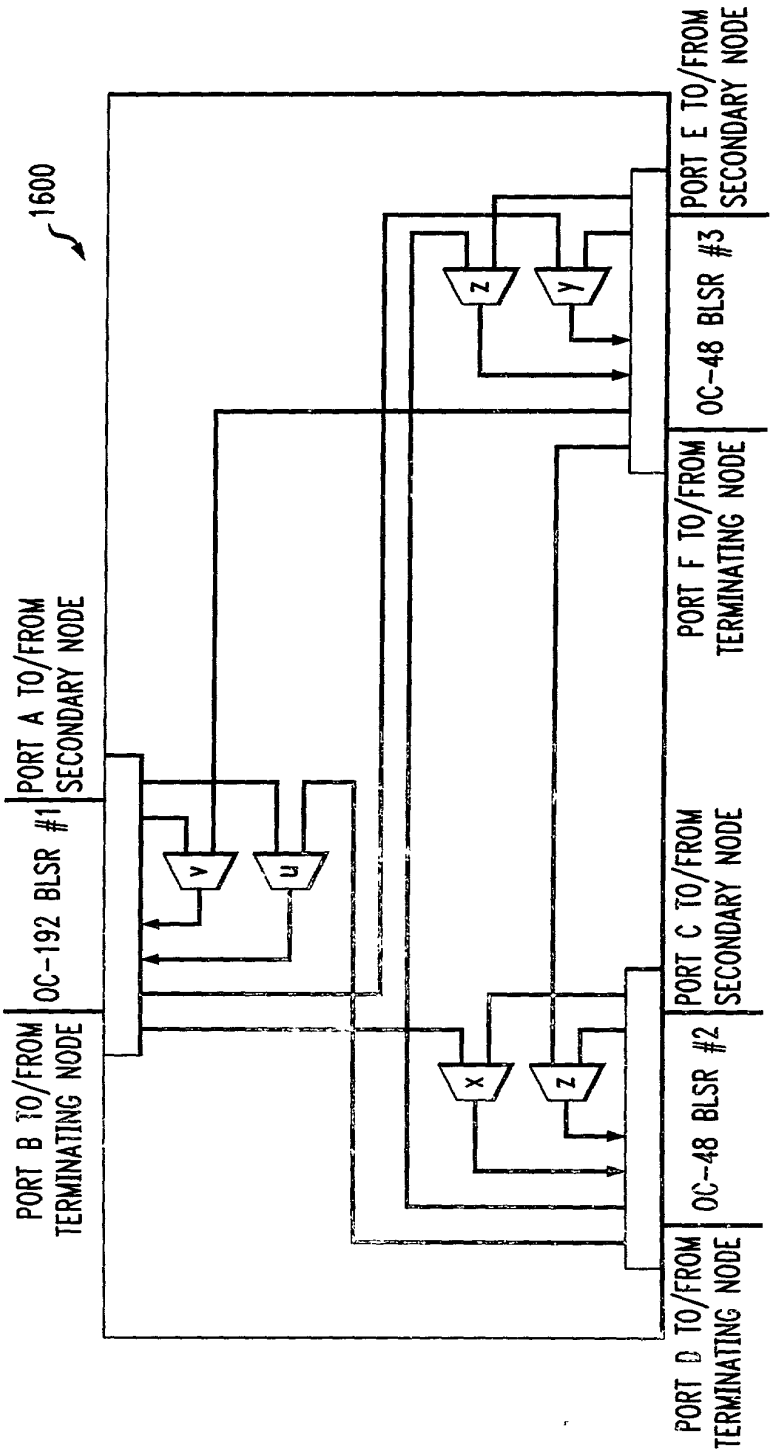
FIG. 16